

# WASTE DISPOSAL



## Simulated Landfills

Grade Level : 4

### Subjects:

Science 3.2  
Social Studies 11.1  
Math 2.3, 4.3

### Time:

one class period for concept development and project  
twenty days for observation

### Setting:

classroom, outdoor space to put shoeboxes

### Materials:

a variety of organic and inorganic waste  
2 large cardboard shoeboxes  
scissors  
1 gallon plastic milk jug  
4 garbage bags  
10 lbs. soil  
watering can with water

### Skills:

observation, measurement, comparison, data collection, draw conclusions

### Vocabulary:

open dump, landfill  
sanitary landfill,  
leachate, organic waste  
inorganic waste,  
biodegradable

### Source:

*Action for a Cleaner Tomorrow*  
South Carolina Department of Health and Environmental Control

**Summary:** Students make a simulated open dump, traditional landfill, and sanitary landfill to observe differences among them and contemplate the affect on the environment.

**Objective:** Students will discover how landfills work and how they affect their environment. Students will recognize how landfills differ from illegal open dumps.

**Background:** (See Subtitle D Landfills) Leachate is the liquid that accumulates at the bottom of a pile of waste. It may find its way into the groundwater system.

**Leading Question:** What is the best method for solid waste disposal?

### Procedure:

1. Discuss the new requirements for sanitary landfills and compare them to procedures used prior to the 1980's at open dumps. Ask for student hypotheses about why current specifications are required. (Early procedures for disposing of waste often polluted the environment.)
2. Explain that the class will construct mini-landfills and a mini-open dump in order to observe what happens in each.
3. With all materials before the class, call individuals to come forward and separate the waste items into "organic" and "inorganic" piles. Others make lists of items in the two piles. (Include plastic items, paper scraps, metal items, fabric, food scraps such as fruit peels, newspaper, etc.)
4. Then call on individuals to come up and do the following steps:  
**Open Dump:** In a large cardboard shoebox, place 3 inches of soil to cover the bottom of the box. Pack it down. Heap in organic and inorganic wastes. Sprinkle with water; label it "Open Dump". Place outside on top of a garbage bag. Every other day sprinkle with 1/2 cup of water. Leave it open to the sun and air. Observe over time.  
**Traditional Landfill:** In a large cardboard shoebox, place 3 inches of soil all over the bottom of the box. Pack it down. Heap in wastes. Add another layer of soil, another layer of garbage, then top with a layer of soil 3-4 inches deep. Label the box "Early Landfill." Place it in a plastic garbage bag, sprinkle with water and seal with a twist tie. Take it outside where it will remain undisturbed. Every other day open the landfill to sprinkle with 1/2 cup of water. Observe over time.

## Simulated Landfills

**Sanitary Landfill:** Take a gallon-size plastic milk jug and cut out near the top around 3 sides to create a large opening. (The heavy plastic represents the landfill's liner.) Place a heavy garbage bag inside covering the bottom. (This represents another protective layer.) Add 2 inches of soil and pack it down. Heap in organic and inorganic wastes, add another layer of packed soil, another layer of waste, then top with a layer of soil. Seal the cut and top of the jug with heavy duty tape. Because the top is sealed, this will represent a closed landfill, not an operating one. Label it "Sanitary Landfill" and place it in a plastic garbage bag and twist tie it closed. Take it outside. Open it only to observe. Do not water it.

5. Give a Landfill Questionnaire to each student or designated group for discussion or completion.
6. As observations are made over time, write about the findings. Ask open-ended questions such as "What would happen if dangerous chemicals were thrown into an open dump or a landfill?" "What effect would a landfill have on its environment?"
7. At the end, after all observations are complete, teams could do questions 1, 6, and 7 on the Landfill Questionnaire once again to see if their responses have changed.

### What Now?

1. Arrange for students to visit a nearby solid waste disposal site.
2. Discuss the advantages of the waste disposal method used there. Are there better methods available?

## LANDFILL QUESTIONNAIRE

1. What 6 words do you associate with a landfill?

\_\_\_\_\_

\_\_\_\_\_

2. Does your city or county have a landfill? If yes, where? If no, where is your city or county's solid waste disposed? \_\_\_\_\_

\_\_\_\_\_

3. Who selects landfill sites? \_\_\_\_\_

4. What would you consider to be an ideal site for your garbage? \_\_\_\_\_

\_\_\_\_\_

5. If it were determined that our town had an environmentally safe site for a landfill, would you support locating it at the site? Yes \_\_\_\_\_ No \_\_\_\_\_

Why? \_\_\_\_\_

6. Do you think landfills have a negative impact on:  
(1-strongly agree; 2-agree; 3-disagree; 4-strongly disagree)

Air Quality	_____	Property Values	_____	Aesthetics	_____
Town's Image	_____	Neighborhood	_____	Traffic	_____
Wildlife	_____	Water Quality	_____	Taxes	_____

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## "SUBTITLE D LANDFILL"

### Layers of the Landfill

Today's sanitary landfill is engineered to protect public health and the environment.

Subtitle D of the Resource Conservation and Recovery Act establishes standards that municipal landfills must meet. A Subtitle D Landfill is layered like this ➡



**Top Cap - The top cap of a landfill must be covered with:**

- 2 ft. (61cm) thick soil cover
- Drainage layer
- Flexible membrane layer of 60 mil HDPE plastic\*
- 18 inches (45.7 cm) minimum clay liner ( $1 \times 10^{-3}$  cm/sec max)
- Gas management layer

**Bottom Liner - The landfill must have a protective bottom liner system that includes:**

- 2 ft. (61cm) protective layer of soil
- Leachate collection system
- Flexible membrane liner (60 mil HDPE plastic\*)
- 2 ft. (61cm) clay liner ( $1 \times 10^{-3}$  cm/sec\*\*)